SOFIA Sets Infrared Eye On Heavens

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MOFFETT FIELD, Calif. – It takes a 747 to bring the world of infrared astronomy into plain sight.

In 2002, the American and German space agencies will begin flying a unique telescope in a bid to understand everything from the birth of stars to how galaxies evolve.

Soaring high above the atmospheric water vapor that makes ground-based infrared astronomy all but impossible, a modified Boeing 747-SP jet will carry astronomers and the largest airborne telescope in the world on 140, eight-to-nine hour flights a year.

The airborne observatory will search the galaxy measuring infrared radiation otherwise blocked by Earth's atmosphere before it reaches our planet's surface. To learn more about the science behind SOFIA, click here .

The nighttime sorties of the $350 million flying mission, formally called the Stratospheric Observatory For Infrared Astronomy (SOFIA), will allow the astronomers on board an unfettered view of the heavens through the plane's 99-inch (2.5-meter) telescope.

Once operational, the reflecting telescope – the mirror of which edges out even the Hubble Space Telescope's in size – should open up the hidden reaches of our galaxy, penetrating the dust and gas that foils the observation of many features in visible light.

And unlike telescopes tied to the ground atop mountains in places such as Arizona, Hawaii and Chile, SOFIA will be free to flit across the globe, practically at the drop of a hat.

"It will be," said SOFIA spokesman Michael Bennett, "the world's largest portable telescope."

The telescope will peer from a cavity cut in the side of the plane, which in a previous life made more than 10,000 takeoffs and

Images

The Kuiper C-141 in flight.

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landings while ferrying passengers for Pan Am and later United Airlines. The jet is expected to fly for at least 20 years.

The jet and its staff of 85 will be based at NASA's Ames Research Center in California's Silicon Valley for most of the year, with perhaps an annual two-month layover in New Zealand to probe targets visible only from the Southern Hemisphere.

An open-door policy will – literally – dictate the use of the jet, which will cruise at altitudes ranging as high as 45,000 feet (13.5 kilometers) to make its observations. For once the jet climbs to altitude, the door shielding the telescope will roll back, exposing the instrument to the sky.

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Rather than train astronomers to hold their collective breaths, the telescope enclosure will be sealed off from the main cabin thanks to a double bulkhead. The aft bulkhead is designed to withstand up to 100,000 pounds (45,000 kilograms) of pressure while the fore can take up to 1 million pounds (453,600 kilograms).

Although the telescope can be maneuvered, most of the targeting will be accomplished by pointing the airplane itself as it flies wide arcs over the Pacific Ocean.

Raytheon Aircraft Integration Services is now modifying the $12 million jet in Waco, Texas for NASA and the German Aerospace Center (DLR). The Universities Space Research Association (USRA) is the prime contractor and operator of the facility on behalf of the two agencies. The project will cost $40 million a year to operate.

Buffeted by 550-mile- (880-kilometer-) per-hour winds and the unpredictable jouncing of flight, the telescope will have to withstand conditions that make for an unlikely mix of the worst of both hurricanes and earthquakes. The telescope's specifications say it can operate even in moderate turbulence.

"That's white-knuckle time," warned Chris Wiltsee, the SOFIA project manager at NASA Ames.

There won't be flight attendants on the flying observatory, but the scientists, engineers and educators will have use of a refrigerator, microwave and coffee maker.

SOFIA will hardly be the first project to take to the heavens to do infrared astronomy.

Astronomers have used aircraft as observational platforms for infrared projects since the early 1960s, beginning when NASA mounted telescopes on both a Convair CV-990 and a Lear Jet.

The short-lived Convair and Lear projects later gave way to the Kuiper Airborne Observatory (KAO), the first full-fledged airborne astronomical research facility and SOFIA's predecessor.

KAO – also based at NASA's Ames Research Center – first took wing in 1974. Its career lasted until 1995, at which point SOFIA had already been under study for nearly a decade.

KAO used a 36-inch (0.9-meter) reflecting telescope mounted aboard a Lockheed C-141A for its science.

Making roughly 72 flights a year, KAO delivered more than many scientists had bargained for, including direct confirmation of Pluto's atmosphere and the stunning 1977 discovery of the nine rings surrounding the planet Uranus.

In 1994, scientists scrambled to fly KAO to watch fragments of the Comet Shoemaker-Levy smash into the planet Jupiter.

Indeed, the ability to dart from spot to spot on Earth gives airborne observatories a distinct advantage over both ground- and space-based telescopes.

"If there's a target of opportunity, like a comet or a supernova, we're able to go after it very quickly," said Eric Becklin, SOFIA's chief scientist and observatory director designate.